

# The EOPEN Pilot Use Cases

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EOPEN Side Event for ESA EO Φ-WEEK 2020 - 28 September - 02 October 2020 EOPEN – Framework for delivering interoperable digital services





# The EOPEN Pilot Use Cases (PUCs)

Overview

- ▷ EOPEN Use Case challenges Application-Service full life cycle support
- > JDIG Architecture
- Providing Weather and Climate Data for Use Cases
- Sentinel 1-2 data use in PUC1 and PUC2
- > Social media data use in all Use Cases
- ▷ Combining EO and non-EO data in PUC1
- Pilot Use Case 1 Flood Risk Assessment and Prevention
- ▷ Pilot Use Case 2 Food Security
- Pilot Use Case 3 Climate Change

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### Application-Service full life cycle support

The EOPEN lifecycle model is used to develop services and has been used to implement 3 pilot use cases

- 1. Flood prevention;
- 2. Food security;
- 3. Climate Change.



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### JDIG Architecture

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Data Collection						Improvement needed	
Historical Snow data						No data or innaccurate	
Current Snow data						Not Applicable	n/a
Predicted Snow data							
Historical Climate data					Data	Capability assessment	
Current Climate data					1-1.5	Red	
Predicted Climate data					1.51 - 2.5	Amber	
Data Analytics					2.51 - 3	Green	
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JDIG (Joint Decision & Information Governance Architecture) was used in combination with traditional requirements gathering to perform robust analysis of the current and target operating models.





### **Providing Weather and Climate Data for Use Cases**



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### Sentinel-1 and Sentinel-2 data use in PUC1 and PUC2

Deep Convolutional Neural Network (DCNN) for remote sensing classification in order to identify water areas in a S-1 image.





Outlier detection (S-1) and DCNN (S-2) to detect changes between water areas so as to discriminate flooded areas from permanent water.

Outlier detection (S-1) to detect rice paddy cover changes, using pseudo-labelling for transferable supervised learning.

This allows for the accurate nation-wide depiction of rice paddy extent and consequently the large-scale monitoring of food security in South Korea.



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### Social media data use in all PUCs



- ▷ Real-time collection of Twitter posts based on keywords, location, and accounts
- > Automatic geotagging of tweets in English, Italian, and Finnish
- > Visual concepts extraction from Twitter images





- Detection of trending topics on Twitter
- Identification of user communities and influential accounts
- Detection of events based on the rise of collected tweets

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#### Combining EO and non-EO data in PUC1

- Detected floods and geotagged tweets are semantically represented in RDF
- Given an area and time of interest, geospatial semantic queries in GeoSPARQL can retrieve data of both types
- Results visualised on an interactive map



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### Pilot Use Case 1 (PUC1) - Flood Risk Assessment and Prevention

#### The EOPEN Platform for flood impact reduction



#### **AAWA Facilities**

#### **EOPEN Support**

A distributed concept for flooded area delineation. With EOPEN service providers can merge the information provided by classic hydraulic models with satellite imagery and data from social media (Tweets) without the need to build their own ICT infrastructure.

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### PUC1: Hydrological model for flood prediction





The EOPEN platform provides the opportunity to develop the concept of flooded area delineation. With EOPEN users can merge the information provided by classic hydraulic models with satellite imagine and data from social media inside a unique platform without the needs of a specific ICT infrastructure.

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### PUC1: The EOPEN Platform for flood reduction

Precipitation Levels Warning System

# Flood Risk Assessment and Prevention



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# Pilot Use Case 2 (PUC2) - Food Security in South Korea

# The problem

Overproduction of rice

- Large storage costs
- Underproduction of other major grains
- High dependence on imports

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### PUC2: EO-based Food Security Monitoring South Korea

- – Challenges - →

01 Interoperability

02 Exhaustiveness

03 Transferability

04 Scalability

05 Reliability

Requirements

Big Data Management (TBs of data)

• Distributed processing

• Low dependence on ground truth information

• High generalization of machine learning modeling





Solutions – –



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## **EO-based services**



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# **Rice Paddy Mapping**



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### **Rice Status, Biomass, Yield Indicators**





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PEI





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#### **Stakeholder Challenges**

#### **Reindeer herders**

- extra feeding due to ice under the snowpack
- molding problems in summers
- changes in reindeer pastures

#### **Reindeer researchers**

- long-term consequences for reindeer herding in Finland

# Finnish Transportation and Infrastructure Agency

- increased road maintenance due to freezing/thawing
- insufficient monitoring of lower class roads

#### **Stakeholder Requirements**

- user-friendly interface
- easy access and management of data
- overlay satellite data over map
- user able to select areas of interest
- real-time visualization
- historical data browsing
- tools for statistical and timeseries analysis
- future climate projections
- compare multi-platform data
- access to snow-related tweets

#### **EOPEN Solution**

#### Weather and climate data

- HIRLAM forecasts
- FMI ClimGrid
- FMI GlobSnow, SMOS Freeze/Thaw
- FMI OpenData: weather stations, climate projections
- Sentinel land-surface temperature

#### Infrastructure data

- reindeer herding areas
- administrative areas
- FTIA road maintenance classes

#### Visualization

- OpenSphere
- Dashboard
- Desktop apps (QGIS,

ArcGIS, ...)

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### PUC3: Example data products and visualizations



ClimGrid: Air temperature timeseries statistics

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